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Original Research Article

Clinical profile of hypoglycemia in neonates admitted in neonatal intensive care unit of a tertiary care hospital

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ABSTRACT

Background: This study was conducted to study the clinical profile of hypoglycemia in newborn and to determine the prevalence of hypoglycemia among neonates admitted in NICU.
Methods: All newborns admitted in NICU were examined and those with hypoglycemia (GMR<45 mg/dl) were included in the study and observed. In neonates with risk factors blood sugar was screened at 2, 6, 12, 24, 48 and 72 hours of life or whenever symptoms suggestive of hypoglycemia developed in any neonates and for critically sick neonates blood sugar was screened in every 6 hour in active phase of illness. Any neonates with blood glucose level less than 45 mg/dl were analysed for maternal risk factors, neonatal risk factors and course in the NICU.
Results: The prevalence of neonatal hypoglycemia was 14.9% among NICU admissions. The maternal risk factors were GDM, PIH, and PROM. The neonatal risk factors were prematurity, SGA, LGA and comorbid conditions which include perinatal asphyxia, sepsis, polycythemia, shock. The common symptoms were poor feeding, lethargy, jitteriness, convulsions, irritability, hypotonia and cyanosis. Majority of the neonates required only oral feeds for correction of hypoglycemia.
Conclusions: Blood glucose screening in neonates with this risk factor is mandatory as many of the neonates were asymptomatic. The importance of early initiation of breast feeding to prevent hypoglycemia should be emphasized.

Keywords: Clinical profile, Hypoglycemia, Neonates, Prevalence, Risk factors

INTRODUCTION

Hypoglycaemia is the most common metabolic condition occurring in newborn. It is influenced by factors like birth weight, gestational age, perinatal complications and feeding behaviour.[1-3] Incidence of hypoglycaemia varies with the definition, population feeding and the type of glucose assay.[4,5] The overall incidences vary from 1 to 5/1000 live births and seen about 17% of babies that are hospitalised in NICU.[6] The definition of hypoglycemia in newborn has remained controversial due to lack of significant correlation between plasma glucose concentration, clinical symptoms and its long term sequelae.[7] Operational threshold for hypoglycemia is defined as the concentration of plasma or whole blood glucose at which clinician should consider intervention based on currently available evidence in literature.[8] Operational threshold has been defined as blood glucose level less than 40 mg/dl (plasma glucose level less than 45mg/dl).[9] WHO defined hypoglycaemia as blood glucose level less than 45 mg/dl.[10] The clinical spectrum of hypoglycaemia is not specific. It can be symptomatic or asymptomatic. Symptoms are convulsion, lethargy, hypotonia, high pitched cry, cyanosis and are non-specific and can be missed easily especially in sick neonate.[11-13] Neonatal hypoglycaemia can be easily treated if recognized early. Untreated hypoglycaemia whether symptomatic or asymptomatic results in neurological impairment and mental retardation of varied severity.[14,15]

Aims and objectives

To study the clinical profile of hypoglycemia in newborn and to determine the prevalence of hypoglycemia among neonates admitted in NICU.

METHODS

This study was conducted as a prospective observational study, among newborns with hypoglycemia admitted in NICU, Department of Pediatrics, Rajiv Gandhi Government Women and Children Hospital, Puducherry, between November 2018 and November 2019 after obtaining informed consent. The sample size was calculated considering the prevalence of hypoglycemia in neonates in previous studies using OpenEpi16 software.

Sample size was 217 cases with hypoglycemia. All newborns born at Rajiv Gandhi Government Women and Children Hospital, and admitted in NICU with blood glucose less than 45 mg/dl were included in the study. Exclusion criteria include babies born outside RGGW and CH, Parents who are not willing to participate in the studies, newborns with persistent hypoglycemia which require enzyme and genetic evaluation. In neonates with risk factors blood sugar was screened at 2, 6, 12, 24, 48 and 72 hours of life or whenever symptoms suggestive of hypoglycemia developed in any neonates and for critically sick neonates blood sugar was screened in every 6 hour in active phase of illness.

Any neonate with blood glucose level less than 45 mg/dl were analyzed for maternal risk factors, neonatal risk factors and course in the NICU.

RESULTS

The total number of admissions in NICU during the study period was 1471 and among them the prevalence of hypoglycemia was 220 (14.9%). Among the 220 neonates with hypoglycemia, 137 (62.3%) were males and 83 (37.7%) were females. Among the study population 185 (84.1%) of neonates had at least one risk factor (maternal/neonatal) and 35 cases (15.9%) had no risk factor.

Table 1: Descriptive analysis of maternal risk factors in the study population (n=220).

Maternal risk factors	Frequency	Percentage
GDM/overt DM	41	18.6
PIH	24	10.9
PROM>18 hours	2	0.9
No risk factors	149	67.7

*Data represented as number and percentages

The maternal risk factors that were associated with hypoglycemia were GDM, PIH, PROM. 20.4% had GDM, 14% had PIH and 0.9% had PROM as maternal risk factors. 67.7% had no maternal risk factor (Table 1).

The neonatal risk factors associated with hypoglycemia were prematurity (28.2%), SGA (29.5%), LGA (5.9%), IDM (20.4%) and comorbidities (sepsis, birth asphyxia, polycythemia and shock) were present in 16.3% of the hypoglycemic neonates. Among the comorbid condition birth asphyxia was present in 12 (5.4%), sepsis in 19 (8.6%), polycythemia in 4 (1.8%) and shock in 1 (0.45%). 84% of the hypoglycemic neonates had at least one risk factor (Table 2).

Table 2: Descriptive analysis of neonatal risk factors in the study population (n=220).

Neonatal risk factors	Frequency	Percentage
Preterm <37 weeks	62	28.2
SGA	65	29.5
LGA	13	5.9
IDM	45	20.4
Associated comorbidities	36	16.3
Nil	35	15.9

Out of 220 children with hypoglycemia 136 (61.8%) were asymptomatic and 84 (38.2%) presented with symptoms. The common symptoms were poor feeding (69%), lethargy (17.8%), jitteriness (11.9%), convulsions (9.5%), irritability (4.7%), hypotonia (2.3%) and cyanosis (1.2%). 29% of neonates presented with hypoglycemia on day 1 of life, 26.8% of neonates on day 2, 21.4% on day 3 and 22.7% beyond 72 hours of life (Table 3).

Table 3: Descriptive analysis of clinical features in the study population (n=220).

Clinical Features	Frequency	Percentage
Irritability	4	1.8
Poor feeding	44	20.0
Jitteriness	10	4.5
Seizures	8	3.6
Lethargy	3	1.4
Lethargy, poor feeding	12	5.5
Hypotonia, poor feeding	2	0.9
Cyanosis	1	0.5
No symptoms	136	61.8

*Data represented as number and percentages

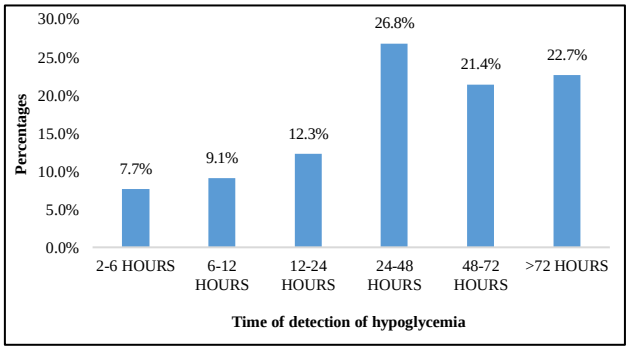

Figure 1: Time of detection of hypoglycemia in the study population (n=220).

The time for detection of hypoglycemia in newborn were 2-6 hours in 7 (7.7%), 6-12 hours in 20(9.1%), 12-24 hours in 27 (12.3%), 24-48 hours in 59 (26.8%), 48-72 hours in 47 (21.4%) and >72 hours in 50 (22.7%) of cases (Figure 1).

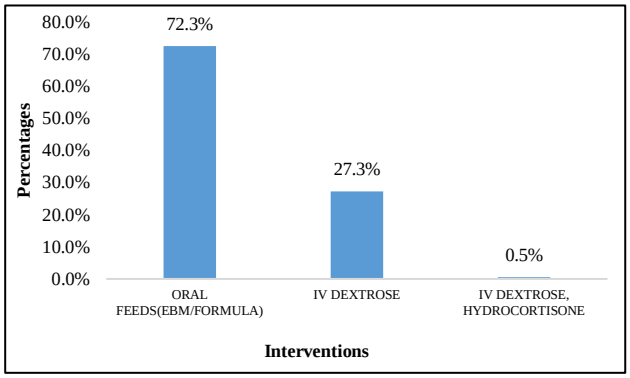

Figure 2: Interventions in the study population (n=220).

In our study 159 (72.3%) neonates required oral feeds (EBM) for the correction of hypoglycemia, 60 (27.3%) required i.v. dextrose and 1 (0.5%) neonate required hydrocortisone (Figure 2). Out of 220 neonates 18 (8.2%) neonates attained euglycemia within 30 minutes, 16 (75.9%) in 1 hour, 23 (10.5%) in 2 hours, 9 (4.1%) within 2-6 hours and 3 (1.4%) neonates required 6-12 hours to attain euglycemia. Out of 220 neonates 145 (65.9%) required 24 hours of hospital stay, 19 (8.6%) required 24-48 hours, 20 (9.1%) required 48-72 hours, and 36 (16.4%) required more than 72 hours of NICU stay (Figure 1).

In the present study 214 (97.3%) neonates recovered and mortality was in 6 (2.7%) neonates. The causes of neonatal mortality were birth asphyxia in 2 cases (33.3%, extreme prematurity with RDS in 2 (33.3%, sepsis in 1 (16.7%) and, MAS with PPHN in 1 (16.7%) neonate. All these neonates had become euglycemic following treatment but had expired because of the co-morbidities.

DISCUSSION

In the present study prevalence of hypoglycemia was found to be high in male newborns 62.3% than in female 37.7%. This was similar to the study conducted by Dhananjaya et al, Singh et al, Babu MR et al.[16-18]

Most neonates with hypoglycemia had maternal risk factors such as maternal diabetes 20.4%, PIH 14%, PROM 0.9%, 67.7% had no maternal risk factor. The percentage of GDM as a risk factor in hypoglycemic newborn (20.4%) in the present study was similar to that of Singhal et al (23.8%), because of the similar inclusion criteria for GDM.[19] In the study by Babu et al, percentage of GDM (5%) as a risk factor in hypoglycemic newborn was comparatively low because of difference in inclusion criteria such as exclusion of pre-gestational DM and mothers on OHA.[18] PIH was a risk factor in study conducted by Singh et al (11%) which is similar to the current study (14%).[17] Percentage of PROM was very less (0.9%) when compared to other studies like Singh et al (8.5%), Amarendra et al (15.3%) as we taken PROM more than 18 hours as a risk factor.[17,20]

Most neonates with hypoglycemia had neonatal risk factors such as prematurity (28.2%), SGA (29.5%), LGA (5.9%), IDM (20.4%) and other associated comorbid conditions (16.3%). In the present study prematurity was the one of the common neonatal risk factor which contributes 28.2%. Other studies showed incidence as follows, Singhal et al (12.8%), Singh et al (46%), Dhananjaya et al (11.9%).[16,17,19] SGA contributes 29.5% hypoglycemic babies in the present study which is similar to studies conducted by Singhal et al (17%), Singh et al (23.5%), Anjum et al (29%).[17,19,21] LGA contributes 5.9% of hypoglycemia in the present study which is similar to other studies by Singh et al (4.5%), Holtrope et al (5%).[17,22] 16.3% neonates had associated comorbid conditions. Among them perinatal asphyxia accounts for 5.4%, sepsis 8.6%, polycythemia 1.8% and shock 0.45%. 84% neonates had at least one single risk factor similar to the study conducted by Sashidaran et al (89.1%).[23]

Asymptomatic hypoglycemia seen in 61.8% and 38.2% neonates had hypoglycemia with symptoms. This was similar to the studies conducted by Singh et al, Singhal et al, Amerandra et al.[17,19,20] Among the symptomatic newborns, 69% presented with poor feeding, 17.8% presented with lethargy, 11.9% presented with jitteriness, 9.5% presented with convulsions, 4.7% presented with irritability 2.3% presented with hypotonia, 1.2% presented with cyanosis.

In 29% of the newborns hypoglycemia was detected in first 24 hours. In 26.8% hypoglycemia was detected in day 2 of life. In day 3 of life 21.4% were found to have hypoglycemia. 22.7% were found to be hypoglycemic beyond 72 hours of life. In Dhananjaya et al majority of the newborn (55.26%) were found to be hypoglycemic in day 2 of life.[16] The percentage of hypoglycemia in Amarendra et al was very high in the first 24 hours (86.11%).[20]

72.3% hypoglycemic neonates were corrected by oral feeds. 27.3% required i.v. dextrose and only 0.5% required hydrocortisone. Results were varied from the study done by Singh et al which showed 34% hypoglycemia required oral feeds and 66% required i.v. fluids.[17] 8.2% attained euglycemia within 30 minutes, 75.9% attained euglycemia in 1 hour, 10.5% required 2 hours to attain euglycemia, 4.1% neonates attained euglycemia within 2-6 hours and 1.4% neonates required 6-12 hours to attain euglycemia. 65.9% neonates required only 0-24 hours of NICU stay. For 8.6% neonates duration of NICU stay was 24-48 hours. 9.1% neonates stayed in NICU for 48-72 hours. 16.4% neonates required more than 72 hours of NICU stay.

97.3% neonates with hypoglycemia were recovered similar to the studies done by Singh et al (90.2%).[17] Neonatal mortality was 2.7% in present study, the most common causes of neonatal deaths were not due to hypoglycemia per se but due to co morbid conditions like birth asphyxia, extreme prematurity with respiratory distress syndrome, sepsis, meconium aspiration syndrome with PPHN.

This study has some limitations. The study group included only neonates admitted in NICU and not all neonates delivered in the hospital, so the data may not represent the entire population. Outborn babies were also not included. Neonates with persistent hypoglycemia were excluded from the study due to non-availability of the investigations. Neurodevelopmental outcome in these babies on follow up were not assessed in the present study. A prospective study with larger sample size incorporating these limitations would be ideal

CONCLUSION

The incidence of neonatal hypoglycemia was 14.9% among NICU admissions. The maternal risk factors associated with neonatal hypoglycemia were GDM, PIH, PROM and the neonatal risk factors were prematurity, SGA, LGA and comorbid conditions which include perinatal asphyxia, sepsis, polycythemia, shock. Since most of the neonates with hypoglycemia were asymptomatic. Among the symptomatic neonates poor feeding was the most common symptom on presentation and most of them achieved euglycemia with oral feeds.

Recommendations

Most of the neonates had risk factor and many of the neonates were asymptomatic, hence mandatory blood glucose screening in neonates with these risk factors serves as an effective measure for identification for hypoglycemia. Most cases became euglycemic only with oral feeds. Hence focused counselling on the early initiation of breast feeding will reduce the incidence of hypoglycemia and its complications.

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